

GOVERNMENT STATISTICS: E-COMMERCE AND THE ELECTRONIC ECONOMY

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Government Statistics: E-Commerce and the Electronic Economy

The growth, integration, and diffusion of information technology and communications is changing our society and economy. Today, computers and other electronic devices increasingly communicate and interact directly with other devices over a variety of networks, such as the Internet. Consumers and businesses have been particularly quick to recognize the potential and realize the benefits of adopting new computer-enabled networks. Many consumers now routinely use computer networks to identify sellers, evaluate products and services, compare prices, and exert market leverage. Businesses use networks even more extensively to conduct and re-engineer production processes, streamline procurement processes, reach new customers, and manage internal operations. This electronic revolution is spurring additional investments in facilities, hardware, software, services, and human capital. Ultimately, it may change the structure and performance of the American economy as much as the introduction of the computer a generation ago.

While the burgeoning use of electronic devices in our economy is widely acknowledged and discussed, it remains largely undefined and unrecognized in official economic statistics. This paper highlights some of the issues associated with measuring our electronic economy, emphasizing the measurement of e-commerce. It also describes Bureau of Economic Analysis (BEA), Bureau of Labor Statistics (BLS), and Bureau of the Census (BOC) electronic economy programs and initiatives, and concludes by posing a long list of questions, the answers to which would aid agencies in setting measurement priorities.

I. Definitions

Various terms are used to describe the electronic economy and its components. These include, but are not limited to, the digital economy, e-business, e-commerce, e-infrastructure, and even the “new economy.” The Economics and Statistics Administration (ESA) of the Department of Commerce (DOC), is about to issue its third report on the digital economy.^{1 2} In its measurement efforts, the BOC has found it useful to think of the electronic economy as having three primary components—e-business processes (how business is conducted), e-commerce transactions (buying and selling), and e-infrastructure (which supports electronic activities).³ A paper on measuring the new economy recently was presented at the BEA Advisory Committee meeting.⁴ BLS has discussed e-commerce with its Business Research Advisory Committee and is planning to do so with its Labor Research Advisory Committee in June.⁵

Establishing relevant and consistent definitions is a critical first step in developing useful measures of the electronic economy. Policymakers, industry, and the media use a variety of terms to describe digital or electronic economic activity. Moreover, these terms often are used interchangeably and with no common understanding of their scope or relationships. Consequently, this paper begins by defining terms to establish a common point of reference.

¹ Both BEA and BOC are within ESA.

² Department of Commerce (1998), ESA (1999).

³ Mesenbourg (1999).

⁴ Landefeld and Fraumeni (2000).

⁵ Manser (2000).

IA. Digital economy

The digital economy is comprised of e-commerce and information technology (IT)-producing and IT-using industries. IT-producing industries include computer hardware, software/services, communications equipment, and communication services industries. ESA defines industries as IT-using if they are among the top 15 industries as measured by either of two measures: IT net capital stock as a share of total equipment stock or IT investment per employee. This criterion results in approximately twenty 2-digit SIC industries being classified as IT-using.⁶ E-commerce is defined below.

IB. E-business

E-business is any process that a business organization conducts over a computer-mediated network. Business organizations include any for-profit, governmental, or nonprofit entity. Examples of online e-business processes include: purchasing, selling, vendor-managed inventory, production management, and logistics, as well as communication and support services, such as online training and recruiting. Computer-mediated networks are electronically linked devices that communicate interactively over network channels. A variety of electronic devices can be linked, including computers, Internet-enabled cellular phones, personal digital assistants, and WebTV. Such links generally involve minimal human intervention. Networks include the Internet, Intranets, Extranets, Electronic Data Interchange (EDI) networks, and telecommunication networks. These networks may be either open or closed.

⁶ ESA (1999), pp. 15, 26-28.

IC. E-commerce

E-commerce is any transaction completed over a computer-mediated network that involves the transfer of ownership or rights to use goods or services. Transactions occur within selected e-business processes (e.g., selling process) and are completed when the agreement between buyer and seller to transfer the ownership of, or rights to use, goods or services occurs over computer-mediated networks. Electronic agreement, not payment, is the key determinant of an e-commerce transaction. Unpriced transactions such as downloading free software available on the Internet are excluded. Examples of e-commerce transactions include sales of books or CD-ROMs over the Internet, an electronic marketplace selling parts to another business, a manufacturing plant selling components to another plant within the company using the firm's Intranet, and a manufacturer selling to a retailer over an EDI network.

ID. E-infrastructure

E-infrastructure is the infrastructure used to support electronic business processes and conduct electronic commerce transactions. It includes hardware, application software, telecommunication networks, support services, and human capital used in electronic business and commerce. Nonhuman e-infrastructure investment is produced by the IT-producing industries described above. These industries are thought to be a primary engine of economic growth in the new economy.

IE. New economy

As many analysts are unsure if we are in a new economy, defining precisely what the term new economy means is difficult. The new economy, if we are in one, appears to be the product of various structural changes occurring in the last two decades that have contributed to the recent improvement in economic performance.

II. Measurement of E-Commerce

There are at least four major questions relevant to the discussion of e-commerce measurement:

- ! Are aggregate economic statistics fully covering e-commerce?
- ! Are there particular measurement problems associated with e-commerce?
- ! Should e-commerce and the impact of the electronic economy be identified and tracked separately?
- ! What are some of the major alternatives in e-commerce measurement?

These questions form the core of this paper and, along with the question of priorities, the debate before FESAC.

IIA. Are aggregate economic statistics fully covering e-commerce?

The general consensus is that the vast majority of e-commerce activities are covered in aggregate U.S. economic statistics. E-commerce businesses, many of which are new companies, are included in the establishment-based data series. While there is some lag in introducing new businesses into the sample frames, it is not believed that this is contributing to significant under- coverage of e-commerce establishments. The BLS and BOC sample frames, which are based on Unemployment Insurance and Internal Revenue Service administrative records, respectively, capture new establishments within a very short time period.⁷ Samples of establishments are selected from these frames, and sample rotation is carried out for different surveys on various schedules. If surveys capture new establishments at different rates, this could pose problems for analyses or measures

⁷ The Business Establishment List (BEL)-Standard Statistical Establishment List (SSEL) discussion during this same FESAC meeting is relevant to the e-commerce discussion as well.

that depend upon multiple sources.⁸ These are essentially the same issues that always arise for data collection in dynamic sectors of the economy, but they could become more significant if e-commerce business entry and growth are more rapid than the entry and growth that have occurred in the past.

IIB. Are there particular measurement problems associated with e-commerce?

It is much more difficult to answer this question than the previous question. Can all the dimensions of what is going on in e-commerce be picked up? For example, how is business-to-business (B2B) and business-to-consumer (B2C) e-commerce impacting on the accuracy of labor surveys; goods and services choices, characteristics, and prices; the difficulty of tracking international transactions; and business costs and productivity?

With respect to labor surveys, new types of businesses do not seem likely to pose particular problems for measuring some things, such as employment and hours. E-commerce businesses, however, could pose problems for interpreting trends in other measures, such as wages, if they are more apt to use types of compensation, such as stock options, that are not included in typical wage measures, or if e-commerce workers are more likely to be self-employed.

E-commerce businesses pose additional measurement challenges in that they can quickly expand their product line, adding both new goods and new services, and even enter into entirely new kinds of activities, much faster than their retail and wholesale brick and mortar counterparts.

Amazon.com not only sells books and CD-ROMs, but also hosts auctions, and in the beginning of May introduced its new Lawn and Patio and Kitchen stores. Identifying and monitoring the creation of virtual stores impose additional challenges because many firms do not think of these

⁸ For instance, if new businesses were captured more rapidly in revenue and price measures than in hours data, productivity growth could be overstated.

businesses as separate locations or establishments. New types of businesses, such as info-mediaries and B2B marketplaces, and changes in the supply chain, as well as the ability to vary activities quickly, make industry classification and tracking difficult.

The characteristics and prices of e-commerce products may not be the same as those sold in retail brick-and-mortar outlets or through wholesalers. For example, the Consumer Price Index (CPI) and resulting real personal consumption measures do not capture all aspects of consumer welfare from B2C transactions. E-commerce retail purchases may involve particular amenities for the consumer (such as convenience of shopping from home, added information that is available on the product, or lower prices) or disamenities (such as frustration at lengthy downloads, not being able to feel the quality of fabric in an item of clothing, or service deterioration). These are the types of factors that are not captured in general in measures of prices and real GDP. It is not clear that these sorts of problems are greater for e-commerce than for other activities, nor even that they do not in general wash out. In the area of B2B e-commerce, improved speed and convenience may result in lower costs and higher productivity, but may not be reflected in the measured characteristics or effective prices of the goods and services exchanged or in measures of real output.^{9 10}

The electronic economy is complicating international transactions measurement. Establishing the residency of sellers and purchasers may be difficult because firms may not know the residency of their customers, and vice-versa. For example, customers who purchase goods or services through

⁹ One of the research projects examining the impact of e-commerce and e-business activity on businesses is the Brookings project headed by Robert Litan and Alice Rivlin.

¹⁰ The growing use of e-business processes by more and more businesses may be raising a number of additional issues and challenges for statistical agencies. The media is replete with articles citing the rapid growth of electronic marketplaces and claims that businesses are cutting their purchasing costs significantly as a result of these marketplaces. Cisco permits customers to design and customize products online, electronically transmits the design to contract manufacturing plants, electronically links suppliers with the manufacturers, monitors production in real time, tracks shipment and delivery online, and provides much of their customer support online. This exploitation of networked information can fundamentally change the ways business operate and could have a potentially significant impact on costs and productivity.

the Internet may remit payment to a U.S. bank or another fiscal agent, without realizing that their purchases were from foreign persons. Unlike with goods transactions, nothing is physically shipped when a customer downloads a product from the Internet. The Internet may greatly expand international trade in goods and services because the Internet reduces the effective distance between buyers and sellers. In addition, it may become more difficult to distinguish goods from services. For example, music, books, movies, games, photos, and computer software may soon be transmitted electronically rather than as physical media. Many of these issues also affect domestic transactions measurement, including state and regional measurement.

Priceline.com's recent partnering with some of the largest grocery chains also raises some measurement issues. Consumers bid for groceries at Priceline's site, pay by credit card (often 10-30% discount), and then pick up the groceries at their local super market. Are Priceline sales included in the grocery store retail sales? How is Priceline, a service industry business, reporting these sales?

To complicate the measurement challenge, as Fraumeni et al. (1999, p. 12) have noted, "[a] number of E-commerce activities occur in industries whose output is difficult to measure even if the goods and services are provided through a brick-and-mortar outlet." Examples of such e-commerce activities in IT-using industries include on-line brokerage services and on-line bank account services. In addition, high-tech products and services, forming the backbone of e-infrastructure, are associated with complex quality measurement issues.

IIC. Should e-commerce and the impact of the electronic economy be identified and tracked separately?

Currently, e-commerce represents a small part of the U.S. economy, but it may represent a significant part of the economy in the future. Under these circumstances, what level of effort and resources should be devoted to tracking it? Does it suffice to attempt to ensure that it is reflected in our aggregate statistics or does it need to be tracked separately? If e-commerce activities are very small in a sector or are spread out among many sectors, it may be difficult and very expensive to produce separate series. As it may be impossible to separately identify e-commerce or e-business processes as a source of economic growth, we may have to be satisfied with measures that reflect, but do not separately identify, the impact of the electronic economy.¹¹

Only one official estimate of the size of e-commerce exists. According to recent BOC estimates, e-commerce accounted for about 0.6 percent of retail sales in the fourth quarter of 1999; that percentage share would be slightly higher if eating and drinking establishments (which comprise a substantial part of retail trade and where e-commerce activities are very limited) were excluded. Additional B2C e-commerce expenditures are occurring in other industries, such as hotels and air travel. B2B e-commerce activities are understood to be substantially greater than B2C e-commerce activities, but as of yet there are no official estimates. B2B e-commerce activities occur in various industries, including wholesale trade, transportation of products, and manufacturing.

The adoption of a major revision to the industry classification structure, the North American Industry Classification System (NAICS), which was first employed in the 1997 economic censuses, may help in making electronic economy-related estimates.¹² Other government data series will change from an SIC-basis to NAICS over the next few years. Although NAICS was path breaking in including a separate Information industry, it was developed prior to the recent dramatic growth of the Internet. NAICS retail industry 4541 includes electronic shopping and mail-order houses;

¹¹ A number of researchers have looked at the impact of e-infrastructure on economic growth. See ESA, forthcoming, and Landefeld and Fraumeni (2000) for a bibliography and a summary of this research.

¹² Information on NAICS and proposed changes is available at <http://www.census.gov>.

there is no separation. Proposed changes to NAICS for 2002 would define three separate components of industry 4541: Electronic Shopping; Electronic Auctions; and Mail-order Houses. A major revision to the product classification system, the North American Product Classification System (NAPCS), is currently in the design phase.

In NAICS, wholesale trade categories relate to the type of good sold; there is no distinction between establishments that sell goods on their own account, typically maintaining their own warehouse, and those that arrange for the purchase or sale of goods owned by others or purchase goods on a commission basis, generally not owning or handling the goods they sell. Proposed changes to wholesale trade for 2002 would split activities into industries defined as merchant wholesalers for particular types of products and new industry 425, which would include 42511, B2B Electronic Markets and 42512, Wholesale Trade Agents and Brokers. There are also proposed changes to the Information Sector, NAICS Sector 51.

Because e-commerce is changing so rapidly, any structure adopted may become obsolete in a short period of time. Two BOC-funded projects are assessing how well NAICS captures the dimensions of the emerging digital economy. Producer price index (PPI) program staff at BLS, who have been exploring development of PPIs for wholesale trade, are concluding that this industry is being revolutionized by e-business processes and have formed an internal team to look at the implications for the PPI.

Because of boundary blurring, an establishment-based data system will not always be able to separate store-based and online activities. For example, in retail trade, there is overlap between online sale activities and store sale activities that may increase as "old economy" companies go into online sales in a more significant way. There are reports that major brick-and-mortar retail chains are establishing online sites that have an interrelationship with a store. Sometimes customers pick up an online order at a store or return online products there. The possibility of

establishing online ordering kiosks in a store or a partner store also has been discussed. The problem of joint or overlapping activities within activities occurs frequently, so the issue here is whether it is likely to become unusually significant.

All statistical agencies face classification challenges because of the electronic economy. BEA is a “consumer” of data collected by BLS, BOC, and others. Accordingly, problems faced by the other agencies affect BEA’s ability to accurately reflect economic activity in its accounts.

IID. What are some of the major alternatives in e-commerce measurement?

The major alternatives can be summarized as the following:

- ! Do nothing.
- ! Engage in research on the subject of e-commerce measurement.
- ! Mark data for possible future use.
- ! Add questions or supplements to existing surveys.
- ! Design and implement new surveys.

BEA, BLS, and BOC face resource constraints, and these alternatives must be assessed in the context of the many data needs and challenges facing us. No one in the statistical agencies is suggesting that nothing be done. Accordingly, this paper has already discussed particular measurement problems relating to e-commerce and whether these activities can and should be separately identified.¹³ All three agencies are engaged in research on the subject of e-commerce measurement.

¹³ Although BEA is engaged in e-commerce measurement research, it primarily depends on other agencies and private groups to collect data.

Marking data for possible future use would preserve future options. Data could be recorded in a way that would allow analysts to go back and look at it. An example would be making a purchase by e-commerce a "price determining characteristic" on a checklist for price data collection.

Another alternative is to examine specific questions relating to e-commerce by including additional questions in a survey or adding a supplement to a survey conducted for another purpose. BOC has been actively pursuing this strategy.¹⁴ At BLS, there has been interest in how the change to e-commerce has been reflected in changes in the occupational mix of jobs; to address this, BLS is proposing to test the feasibility of asking respondents to the Occupational Employment Statistics (OES) Survey a few questions concerning their e-commerce activities.¹⁵ BEA is planning to make several changes to the international services surveys to ensure better coverage of e-commerce transactions.

Finally, new surveys can be undertaken. At BOC, a new survey of supply chain organizations is being considered to help in understanding changing functions and activities. New surveys are the most expensive and time-consuming of the alternatives, but the way that the electronic economy is changing e-business processes may require them.

III. BEA, BLS, and BOC Electronic Economy Programs and Initiatives

Each of the statistical agencies has programs and initiatives related to the electronic economy. BOC has been a leader in implementing these projects, BEA has developed and submitted budget proposals to support undertaking such projects, and BLS is beginning to consider whether electronic economy projects should be undertaken in the future. Staff of the three agencies are

¹⁴ See Mesenbourg (1999).

¹⁵ The OES is a very large establishment survey that collects information on the number of employees and wage distributions for detailed occupations.

presently working on revisions to NAICS. In addition, the agencies have begun development of a North American Product Classification System (NAPCS) for products in four key service sector areas: information; finance; professional, scientific, and technical services; and employment services.

III.A. BOC programs and initiatives

This section describes BOC FY 2000 and FY 2001 electronic economy measurement plans. Implementation of the complete FY 2001 priority list will require approval of the BOC budget initiative pending before the Congress.

FY 2000 programs.

In FY 2000 e-commerce measures were introduced in a number of current economic surveys and two research contracts were initiated.

- ! Began collecting monthly e-commerce retail sales in October 1999. BOC continues to collect the data monthly and publish quarterly estimates. The first official retail e-commerce estimates were released on March 2, 2000, covering the fourth quarter 1999. E-commerce sales totaled \$5.3 billion and represented 0.6% of total retail sales. First quarter 2000 estimates were available in late May 2000.
- ! Added e-commerce inquiries to several annual surveys. E-commerce sales questions were added to annual surveys covering retail trade, wholesale trade, accommodations and food services, and the rest of the NAICS services sectors. Firms were asked to report their e-commerce sales for both 1999 and 1998. Retailers and wholesalers also were asked if they were purchasing goods, supplies, or services over computer-mediated networks. For nonstore

retailers (catalog and electronic shopping sites) and all computer, software and office supply firms, BOC will collect additional information: total sales and e-commerce by 11 commodity categories (books, CD-ROMs, computers, software, apparel, etc); e-commerce sales by class of customer (individuals, businesses, government); and total foreign e-commerce sales (percent ranges). Report forms covering reference year 1999 were mailed in March-April 2000. Data review and dissemination will occur beginning late in the year, with data available early in 2001.

! 1999 Annual Survey of Manufactures (ASM) Supplement. A special supplement has been developed that will collect data from some 60,000 manufacturing plants on e-commerce sales and purchases, types of information manufacturers are sharing online with suppliers and customers, and use of e-business processes (present and planned). The supplement will be sent to plant managers in June 2000 and results will be available next year.

! E-business research studies. BOC has two research studies underway

S BOC has contracted with Pembroke Consulting (Dr. Adam Fein) to study changing supply chain industries and organizations. Deliverables for this summer include a description of the changing supply chain, implications for BOC measurement programs, and specific recommendations regarding how better to capture and describe supply chain activities in the 2002 Economic Census and in our current economic statistics.

S BOC also has contracted with IBM Global Services. In phase one, IBM and Dr. Jeffrey Sampler are focusing on the information technology drivers of e-business, and will describe how these drivers are affecting the value-chain, identify the implications for BOC measurement programs, and make specific program recommendations. The second research component, being led by Dr. Hal Varian, is assessing how well NAICS captures

e-business activities and will make specific recommendations regarding how BOC can supplement the NAICS industry classifications to better describe e-business activities and support new 2002 Economic Census data aggregations.

FY 2001 initiative.

A FY 2001 budget initiative proposes to provide the funding needed to institutionalize the program started this year and permit the program to be expanded and extended. Highlights of this initiative are provided here. Additional details are available on the BOC web site. BOC is proposing to:

- ! Provide e-commerce measures for most economic sectors and their associated industries.
- ! Deliver the first official baseline measures of e-business process usage for manufacturing industries as well as for other industries and create ASM supplement links to full ASM data.
- ! Add coverage of electronic marketplaces and other important distribution channels to the annual wholesale trade survey.
- ! Develop e-business infrastructure measures.

IIIB. BEA programs and initiatives

Current BEA resources cannot support major new initiatives. Such activities would require new funding, some of which has been included in the BEA budget request for FY 2001 currently pending before the Congress. BEA is seeking additional financial resources to fully develop the

following new and revised measures of e-business, high-tech, and electronic economy-related activity:

! BEA would work to develop a new index of quarterly investment in e-business-related and high-tech equipment and associated measures of its contribution to real GDP growth and inflation. These data would include:

- S E-business-related/high-tech investment index;
- S Current-dollar and chain-dollar estimates of e-business-related/high-tech investment;
- S Contribution to growth and inflation of e-business-related/high-tech investment.

! BEA would work – in cooperation with BLS -- to develop revised quarterly price and real GDP indexes for major e-business/high-tech-using products and sectors, including:

- S Insurance;
- S Banking, brokerage, and other financial services;
- S Computer and related products and services;
- S Telecommunications equipment and services;
- S Engineering, design, management consulting, and related services; and
- S Education and other services.

! BEA -- in part in cooperation with BLS -- would work to develop revised estimates of employee compensation, personal income, wealth, and saving that better reflect the impact of stock options and capital gains of workers in e-business-related and other high-tech industries.

- ! BEA would revise and expand its surveys of international trade in services and of direct investment to fill gaps in the coverage of e-business/high-tech-related transactions and to identify e-business-related direct investment in the United States and abroad.
- ! BEA would work to develop new aggregations using earnings by place of work for e-business/high-tech-related industries.
- ! BEA would attempt to develop updated and revised “input-output” and GDP-by-industry estimates to help disentangle the effects of e-business and high-tech on final demand versus on intermediate product.

III.C. BLS programs and initiatives

BLS has underway or in the planning stages a number of activities that will improve data for understanding e-business/high-tech activities, although there have been no budget initiatives specifically focused on this topic.

Activities underway or in the planning stage.

- ! With present resources obtained from productivity enhancements and taking sample from manufacturing industries, the Producer Price Index (PPI) program is planning the following:
 - Develop price measures for wholesale trade. For instance, a PPI might be produced for "Wholesale brokerage services" though available resources will not support any breakouts. This industry presumably would include things like the new GM consortium.
 - Test a PPI for the banking industry.

- Publish an index for retail trade industry 5961, Catalog sales. The sample will be very small, however, and it will not be possible to break out e-commerce sales.
 - Improve the treatment of quality change in the PPI for semiconductors.
 - Identify e-commerce business models currently in use and their impacts on the PPI. The group working on this project will explore whether a price index for a sample of current reporters shows price movements similar to those of an index constructed for a matched sample of the internet sites of these same reporters; this will be done for several product lines in one or two industries.
- ! The CPI program has a team examining whether changes are needed to data collection procedures as a result of e-commerce activities and has added an explicit question to the Point of Purchase Survey on whether an outlet is an Internet outlet.
- ! The Employment Cost Index program is exploring the measurement of stock options, which are expected to be particularly large in e-business and other high-tech industries.
- ! The OES program is exploring the possibility of adding a few questions on e-commerce activities.

FY 2001 initiative for expanding price, output and productivity measures.

Funding of the BLS FY 2001 budget initiative to expand price, output and productivity measures will greatly increase information available on key sectors of the economy, which is important for understanding how today's "new economy" is performing. Among other things, this initiative will:

- ! Provide new PPIs for some service sector industries. Use of these new PPIs would be expected to lead to improved measures of overall national output and productivity;
- ! Provide for work to develop new industry productivity measures for a number of service sector industries.
- ! Enable BLS to develop and produce a PPI for SIC 7535 -- Information retrieval services. This category includes Internet service providers.

IV. Questions Related to E-commerce and Electronic Economy Measurement

In order to assist statistical agencies plan and refine future measurement programs, a number of questions are posed for FESAC's consideration. It is not expected that FESAC will be able to reflect on all these questions during the meeting; they are intended to provoke thought and a discussion of what are the most important priorities. The questions deal primarily with e-commerce, but also address some other aspects of the electronic economy. Frequently questions in particular categories also apply to or have implications for other categories; the categories are not intended to be mutually exclusive. Many of the questions reflect initiatives already underway at BOC.

IVA. E-commerce

- ! Early next year BOC will have e-commerce sales estimates available for most industries. What additional e-commerce-related data are needed? What are FESAC's top two e-commerce measurement priorities?

- ! Should there be separate accounts for e-commerce? Does e-commerce need to be tracked separately throughout the economy so that aggregate statistics can be used to answer a question like: "What is the impact of e-commerce on productivity growth?"

- ! Should the advantages and disadvantages to buyers and to sellers of using e-commerce be examined and how should they be treated in defining various measures? Should e-commerce goods and services be quality-adjusted to reflect differences with other goods and services?

- ! How much effort should be devoted to the measurement of price and quantity components of e-commerce goods and services?

- ! Should the OES survey be used to determine the characteristics of workers involved in e-commerce and to determine how, if at all, e-commerce workers differ from other workers, e.g., with respect to union status, or self-employment, or how workplace practices of businesses involved in e-commerce differ from workplace practices of other businesses?

- ! How should we attempt to resolve some of the difficulties with international transactions measurement?

- ! In terms of e-commerce activities, what are the most important research questions that need to be answered? A couple of possibilities include:
 - S Is e-commerce substituting for activities within an industry or is it causing industry growth? To what extent is it replacing things not kept track of separately now, such as replacing telephone calls to mail-order firms or telephone contacts of businesses with potential suppliers?
 - S Will electronic activities become such an integral part of economic processes that it will be impossible to separate out much of this activity, at least for B2B e-commerce?

IVB. E-business

Statistical agencies have minimal experience with process measures.

- ! Is understanding e-business processes is an important area of research? Are there suggestions regarding survey methods and approaches? Are there studies that the agencies should review?
- ! The BOC 1999 Annual Survey of Manufactures E-Business Supplement provides an initial list of e-business processes; have some important processes been missed?
- ! Would creation of an e-business process taxonomy be useful? Are there selected e-business processes that should be focused on initially? What questions related to e-business processes should be answered?
- ! Should an attempt be made to determine the impact of e-business processes on economic growth, or is it a change like the use of teams in the workplace or just-in-time production methods that is important to look at in specific studies, but whose effect is impossible to capture and isolate in aggregate data?
- ! Is the impact of e-commerce analogous to the impact on workplace practices and businesses of electric power, e.g., before electric power workers worked primarily only during daylight hours and businesses located near sources of water power?

IVC. Digital economy

- ! Should an attempt be made to improve industry-based measures of the digital economy, e.g., measures related to IT-producing and IT-using industries?
- ! Should measures of investment in e-business/high-tech be developed along with the contribution of these investments to economic growth?
- ! Should household surveys be implemented, e.g., to look at households' access to and use of computers, as well as to determine the extent of the digital divide?¹⁶
- ! Should we be looking at how telecommuting may be changing how businesses and workers function?

IVD. E-infrastructure

There is a clear overlap between digital economy and e-infrastructure measurement goals. In addition to the questions asked above:

- ! Should projects be undertaken to revise price and quantity measures for e-infrastructure investment? How much of our resources should be devoted to the extension of quality adjusted measures to additional e-infrastructure-related products?
- ! Should e-business-related direct investment in the United States and abroad be tracked?
- ! Are there human capital questions raised by the electronic economy that should be investigated?¹⁷

¹⁶ The National Telecommunications and Information Administration report (1999) looks at the availability of telephones, computers, and the Internet.

IVE. New economy

Many of the component questions of whether new economy measures should be developed have already been posed. These include:

- ! Should an attempt be made to identify the impact of e-commerce, e-business, e-infrastructure, and the digital economy on economic growth and productivity?
- ! Should the agencies provide data that will facilitate analysis of these phenomena?

V. Conclusion

The electronic economy is here to stay. What is uncertain is the extent of the changes it will bring about. The challenge to statistical agencies is to keep up with the evolving economy. Does this present new measurement problems, different from those associated with previous periods of change? Even the answer to that question is uncertain. What is clear is that BEA, BLS, and BOC need to think about e-commerce and electronic economy measurement priorities and the resources to be devoted to them, given our existing measurement programs. FESAC can provide useful input to these deliberations and help shape the agencies' future agendas.

¹⁷ Chapter 7 of ESA (1998) and chapter IV of ESA (1999) discuss many of the relevant issues that might be addressed.

References

Fraumeni, Barbara M., Ann M. Lawson, and G. Christian Ehemann, "The National Accounts in a Changing Economy: How BEA Measures E-Commerce." Paper prepared for the Workshop on Measuring E-Commerce, The Brookings Institution, September 24, 1999.

Economics and Statistics Administration, Office of Policy Development, U.S. Department of Commerce, "The Emerging Digital Economy II," June 1999.

Economics and Statistics Administration, Office of Policy Development, U.S. Department of Commerce, "The Emerging Digital Economy 2000," forthcoming.

Landefeld, J. Steven, and Fraumeni, Barbara M, "Measuring the New Economy," Paper presented at BEA Advisory Committee Meeting, May 5, 2000.

Manser, Marilyn E. "E-Commerce and Government Statistics." Paper presented to the BLS Business Research Advisory Committee, May 10-11, 2000.

Mesenbourg, Thomas J., "Measuring Electronic Business: Definitions, Underlying concepts, and Measurement Plans." Paper presented at the Workshop on Measuring E-Commerce, The Brookings Institution, September 24, 1999 and to the Census Advisory Committee of Professional Associations, October 21-22, 1999.

National Telecommunications and Information Administration, "Falling Through the Net: Defining the Digital Divide" A Report on the Telecommunications and Information Technology Gap in America, July 1999.

U.S. Department of Commerce, "The Emerging Digital Economy," April 1998.